Class : Zoology
Class : XI

Kannada

LOCOMOTION AND MOVEMENT

Locomotion and Movement

- **Locomotion: Voluntary** movements resulting in change in place/location.
- Movement: Significant feature of living beings.
- All locomotions are movements but all movements are not locomotion.

Table: Types of Movement / Locomotion

Type	Structure	Examples and functions
Amoeboid	Protoplasmic streaming	• Leucocytes, macrophages, Amoeba
Ciliary	Cilia	• Removing dust particles from trachea • Passage of ova through female reproductive tract
Flagellar	Flagella	• Water current in Canal System of Sponges • Locomotion in Euglena • Swimming of spermatozoa
Muscular	Muscles	• Movement of limbs, jaws, tongue, etc

Muscles

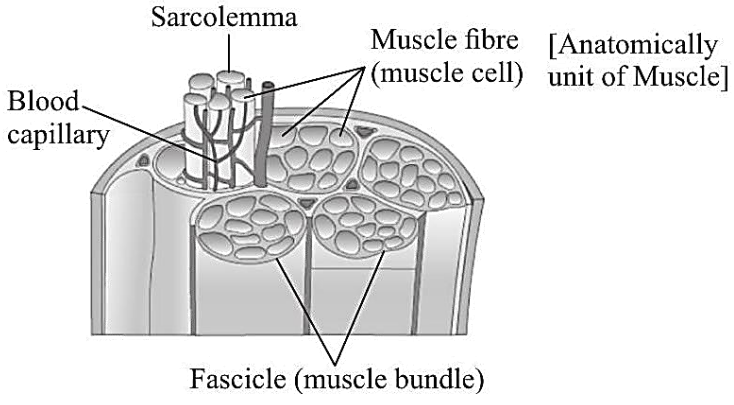
- Mesodermal in origin.
- 40-50% of the body weight of a human adult is contributed by muscles.
- Properties: Excitability, contractility, extensibility and elasticity.

Table: Types of Muscles based on Appearance, Nature of Regulation and their Location

Muscles	Appearance	Regulation	Location
Skeletal	Striated	Voluntary	Muscles of limbs
Smooth	non-striated/smooth	Involuntary	Inner walls of visceral organs
Cardiac	Striated	Involuntary	Muscles of heart

Skeletal Muscle

- Closely associated with the skeletal components of the body.
- Primarily involved in locomotion and body posture.



Skeletal muscle

Many ↓

Muscle bundles/Fascicles

Held by ↓

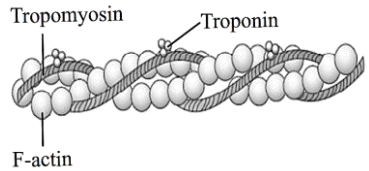
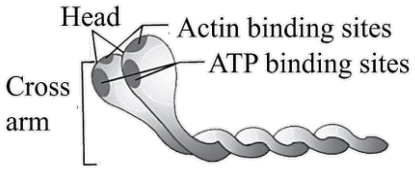
Fascia

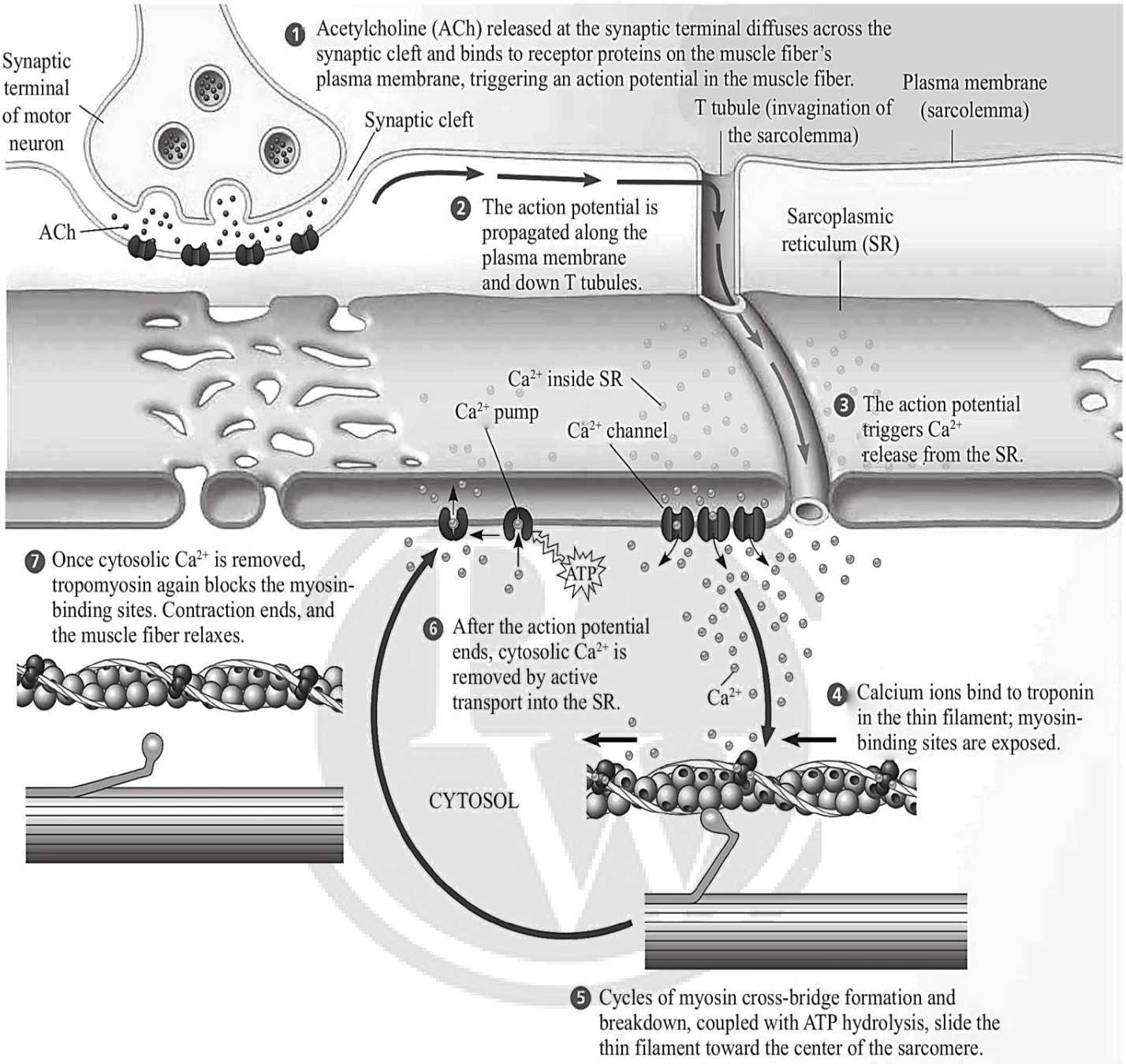
(collagenous connective tissue)

Types of muscle fibres		
Features	**Red**	**White**
Myoglobin	↑	↓
Mitochondria	↑	↓
S R	↓	↑
Respiration	Mainly aerobic	Mainly anaerobic

- Each muscle bundle contains a number of muscle fibres.
- Muscle fibre is a syncitium (sarcoplarm contains many nuclei).
- Endoplasmic reticulum, i.e., sarcoplasmic reticulum of muscle fibre is the store house of calcium ions.
- Each muscle fibre has many parallelly arranged myofibrils/ myofilaments
- Each myofibril has dark and light bands due to actin and myosin distribution that establish striated appearance

Table: Myofilaments and Structure of Contractile Proteins

Filament	**Held by**	**Protein**
❖ Thin 	Z – line (bisect I –band)	❖ Action (contractile) ❖ Made of two 'F' action (polymer of 'G' action) ❖ Tropomyosin ❖ Troponin
❖ Thick 		❖ Myosin (contractile) ❖ Monomeric protein – meromyosin Meromyosin LMM-(light) –Tail HMM-(Heavy) Head Short arm

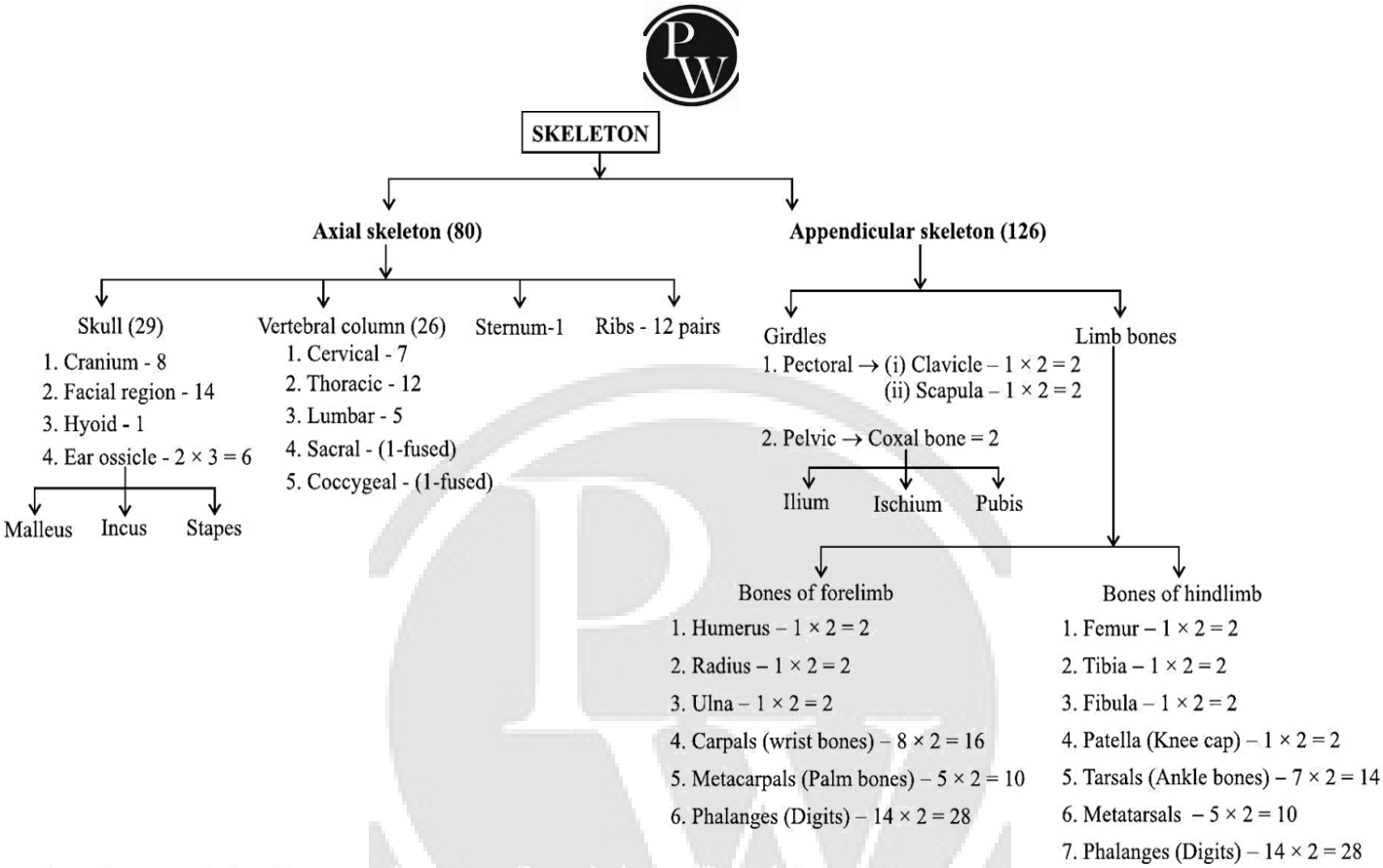


Mechanism of Muscle Contraction

- Contraction of muscle fibre takes place by the sliding of the thin filaments over the thick filaments.
- A motor neuron + Muscle fibres = Motor unit

Skeletal System

- Framework of 206 bones & few cartilages.
- Principle division
    - Appendicular skeleton
    - axial skeleton



- **Scapula,** expanded to form acromion process that articulates with clavicle.
- **Glenoid cavity** in scapula articulates with humerus head to form shoulder joint.
- **Acetabulum,** articulates with femur to form hip joint.
- 2 halves of pelvic girdle meet ventrally to form **pubic symphysis** containing **fibrous cartilage.**

Joints

- They are essential for all types of movements
- Force generated by muscle is used to carry out movement through joint, where joint acts as fulcrum

Table: Types of Joints

Types	Bones joined	Movement	Examples
Fibrous	Dense fibrous connective tissue	Do not any movement	Flat skull bones fused end to end via sutures to form cranium
Cartilaginous	Cartilage	Limited movement	Adjacent vertebrae
Synovial	Fluid filled synovial cavity between 2 bones	Considerable movement, helps in locomotion and many other movements	Humerus & pectoral girdle (Ball and socket joint), Knee joint (Hinge joint), Atlas & axis (Gliding joint), Between carpals (Gliding joint), Carpal & metacarpal of thumb (Saddle joint)

Table: Disorder of Muscular and Skeletal Syste

Disease	Causes	impact
Myasthenia gravis	Autoimmunity	Affect neuromuscular junction Fatigue, weakening and paralysis of skeletal muscles
Muscular dystrophy	Genetic	Progressive degeneration of skeletal muscles
Tetany	Low Ca^{2+} in Body fluid	Rapid spasms in muscle (wild contractions)
Arthritis	Inflammation	Inflammation of joints
Gout	Accumulation of uric acid crystals	Inflammation of joints
Osteoporosis	Age related Decreased levels of estrogen	Decreased bone mass, increased chances of fracture



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